N.A.C.A. BULLETIN

In Three Sections

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EDITORIAL DEPARTMENT NOTE

Although wholly separate techniques, sales forecasting and production planning are inseparable expressions of company purpose as to volume, type, and grade of product to be processed in the factory and disposed of through the channels of trade. If these techniques do not relate to the same quantities and items, subject only to a minimum lag between production and sale, both lose point. The relationship between the two is treated on a practical level in the first article in this issue which introduces a method to coordinate sales and production planning in order to rule out the possibility of maladjustment of this sort.

DAVID M. RUSH, the author, has been General Planning Manager of Ansco, Binghamton, N. Y., since 1945. A native of Alabama, Mr. Rush began his business career as a systems representative for Remington Rand Inc. He transferred to the field of industrial controls in 1935 upon joining the staff of Majestic Radio and Television Corp., and attained the position of Production Control Manager with that company. In 1940, Mr. Rush went with Crosley Corp., Cincinnati, Ohio, as Superintendent of Planning and, four years later, with Carnegie-Illinois Steel Corp., Pittsburgh, Pa., as Coordinator of Planning for the Pittsburgh and Chicago districts.

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Indirect labor exists because of functional efficiencies but, like overhead expenses more remote from the scene of production, tends to cloak inefficiencies if not closely watched. Special efforts of measurement and control are needed. Our second article finds that the substance of such control lies in providing supervisors with simple and adjustable standards of action, and presents a basic form for planning indirect labor requirements.

The author of this presentation is EARL V. HOPTON, Chief of Budgets, Armstrong Cork Co., Lancaster, Pa. Mr. Hopton has had a long association with his company, having been employed as a member of the cost department upon graduation from college. Later he carried out cost system installation assignments for the company and, for the past sixteen years, has headed its budget activities.

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The special subject of parts classification in a company manufacturing equipment units of substantial size is considered in the third article. A two-digit code for use with tabulating equipment is set forth which does not take the place either of part name or number but is employed to serve the needs of accounting, production planning, materials control, and other departments for significant groupings of parts.

MARION H. SIMPSEN, Assistant Controller of the Peoria, Ill. plant of R. G. LeTourneau, Inc., is the author of the article. Mr. Simpsen has served with his company for five years, holding the successive posts of Cost Accounting Supervisor, and Assistant Chief Cost Accountant. He was a member of the production control committee of the plant which served as a coordinating unit of a new system of production control.

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JANUARY 15, 1948

INTERLOCKING THE SALES FORECAST WITH PRODUCTION PLANNING

by DAVID M. RUSH,

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TWENTY-FIVE years ago forecasting and planning were comparatively unimportant. Today because of many drastic changes in the conditions under which we operate, the functions which these words express have become a vital part of any company's plan of coordinating activities in an intelligent manner to assure net profits. The latter portion of this article is devoted to a specific procedure for coordinating methods in use in one company to look ahead in the field of sales and of production, but more or less extended comment on the place of planning in company operations will lend added point to general needs served by this process.

Two definite and outstanding trends appear to be developing. One is a new understanding of the uses of functional planning in management. The other is an almost universal realization that the solution of the complex and almost endless problems of modern competitive industry must lie equally in the field of distribution and production. A degree of planning to which business has never been accustomed will be forced upon it. The quality and accuracy of that planning, as much as the techniques employed, will play an important part in management patterns in the days of keen competition to come.

Factors Focusing Attention on Planning

Shortly after 1920 industry experienced ebbs and flows of demand characteristic of an econmy in which sheer population growth (formerly augmented by immigration) was becoming less important and in which increase of over-all demand, theoretically unlimited, depended on balance in production and consumption which the individual company could not govern. Surplus inventories appeared in goods for which the demand was lessening and, as some enterprising manufacturers began improving and styling their goods, they found that surplus inventories meant losses due to obsolescence. Quality in merchandise became a more important factor. Industry began to realize that mass buying upon

which mass production depended at times failed to support such mass production, and purchasers as a whole now frequently changed their desires very quickly.

All of these influences meant increased cost of goods and narrower margins of profit which in turn provided the impetus for more efficient methods of manufacturing. With this came rapidly increasing wage scales, acceleration in reduction of normal hours of work, and removal of flexibility in hours through penalty overtime rates. Following 1930 it came to be realized that a manufacturer's solution to these problems lay in determining in advance as accurately as possible how much of his products could be sold, when and where they could be distributed, and at what prices, so that he could shape his production schedule to maximum sales advantage, minimize inventory and labor turnover problems, and simplify the financial budget.

Benefits of Planning

Forecasting and planning are nothing more or less than a system of control by which production, purchase of materials, and the employment of capital are coordinated with sales requirements. The focal point of the system is the sales outlet. The flow at this point must be gauged and every other activity must be coordinated with it. Tied in with sales forecasts is not only production scheduling but material and inventory control as well. Production scheduling is an essential technical phase of all plant operations and inventory control is a necessary supplement in order to have the right type and correct quantity of raw materials to fit production schedules and to provide a finished product inventory available at the time that it is needed to meet sales requirements. The outstanding benefits in planning programs combining these elements have been found to constitute a rather impressive list. They include:

1. Lower manufacturing costs.
2. Reduced peaks and valleys in production.
3. Decreased labor turnover, resulting in better satisfied employees and permitting steadier work at better pay.
4. More uniform rates of production with experienced help, better quality in goods, and better satisfied customers.
5. Data through which raw material requirements and purchases can be planned efficiently to maintain both adequate and economical raw material inventories.

6. A plan through which the right type and correct quantity of finished goods can be made in advance to meet the sales demand.
7. More efficient utilization of storage space.
8. Reduced losses from obsolete products by anticipation of changes in demand.
9. Stabilized employment, a discharge of responsibility to the community resulting in more dependable markets for industry.
10. Uniform hours of work per week throughout the year.
11. Reduction of idle machine and man hours resulting in maximum use of equipment and labor.
12. Better control of activities of a variety of departments in which operations depend on aspects of volume of business to be done, including the industrial relations, purchasing, sales and advertising, and traffic departments.

Success in forecasting and planning is dependent on confidence acquired through experience. Those who have progressed in this field state that you cannot hope to begin to cash in on the effort made within two to five years. I would agree with this statement in the usual instance but an aggressive management can save thousands of dollars in reduced manufacturing and distribution costs in a much shorter period of time. While in most cases a statistical forecast will be the first step in the development of a sales forecast, we certainly must consider, in addition, such factors as new products, the effect of the introduction of these products on other products, competition, changes in volume due to price changes, and the effect of special sales or advertising campaigns. All of these factors—and others—must be considered in arriving at a reasonably accurate sales forecast. The question of good judgment is perhaps most important and the one hardest to define. It is a judgment acquired by experience, through honest analysis of that experience, and through confidence developed by such analysis.

Sources of the Forecast

What is forecasting? Is it merely the preparation of the sales forecast at the beginning of the year and monthly adjustment as the year progresses? That in itself is a specialized task and hard to do well. However, it would seem that good forecasting means,

in addition, a constant flow of important information concerning sales and the trend of sales to those responsible for controlling production. The coordination of production to sales requirements is not an easy matter even in those companies which are dealing with a single group of products. If the problem is difficult, the effort should be that much greater, and the judgment of several individuals concerned with any division of the business warrants consideration in the building of a sales forecast.

In all functions, the viewpoint and knowledge available in the sales department is extremely important. It may be that on some of the products the salesman's estimate of the business he can do with definite customers will influence the total forecast to a great extent. There is one other source of information which has been tapped to good advantage by some industries. The customers themselves, whose plans are available for the asking and who can forecast their purchases, may provide real help in this direction. Manufacturing programs based on sound sales forecasts will permit the purchasing department to provide vendors with more accurate estimates of probable requirements of large volume items and by so doing be assured of better prices and service. I do not believe that any one method of forecasting should be laid down to a sales department. The forecast of each product should be compiled in the manner which will allow for the most intelligent interpretation.

The sales forecasts should be taken seriously and, to get full advantage of the benefits possible, the manufacturing plants must have confidence in the forecast and the assurance that when conditions change the forecast will also be changed. Therefore, it seems advisable that when a sales department makes a forecast it should not be considered as something "not to be questioned, but obeyed." Rather such a forecast should indicate the basis on which it is made and divulge special factors that have been considered so that the planning department can provide the plants with a complete story which will inspire their active cooperation. Moreover if any individual in production or sales has a constructive criticism to make, it should receive full consideration.

Cooperation of the Planning Department

In this connection, the planning department should be ready to cooperate with the sales department in the building of forecasts. This should not be taken as a move to bring the making of sales forecasts into the planning department. It does not belong there

because sales departments generally have the intimate knowledge which is necessary to good forecasting of potentials. However, because the science of forecasting is a comparatively new one the planning department can act as a clearing house for information and methods. Until recent times, most companies depended on executives in discharge of their major responsibilities to estimate future sales on the basis of the general business outlook. However, the gradual development of marketing research techniques has provided the opportunity for greater accuracy.

Production planning is the other half of the picture. Precise definitions may vary, but they are all likely to stress one point, coordination. This function achieves its objectives through the coordination and integration of those activities which relate primarily to orders, inventory control, and scheduling of production facilities. By mentioning orders, we have touched on the link with sales. The sales objectives of the company are to secure maximum participation in available markets at prices which will insure a satisfactory profit margin above competitive costs. The operating objectives are to produce the finished product at the lowest total cost. These two sets of objectives sometimes need reconciling and it is the function of management to maintain the proper balance so as to secure the most favorable position for the company. Sales and production planning enable management to perform this function on a factual basis.

Interdependence of Sales and Production Plans

It has been indicated a number of times that production planning will fail without a good sales forecast. It may be mentioned also that there is a factor with respect to which sales cannot be properly forecast without production planning. This is on the question of pricing. The pricing of product from the standpoint of marketing considerations is not within the scope of production planning. It is, however, a function of production planning to supply information which will assist in the determination of prices and in the evaluation of the profit effect of price changes. This is seen to be particularly so when it is noted that industry in general has substantially increased capacity in the past eight years above that fully utilized in any previous year except during the war period. From this it may be concluded that available capacity may exceed demand in a short time. Competitive service in times of below capacity operation requires flexibility so that production

schedules may be adjusted quickly in order to secure desirable business. Proper service likewise includes furnishing customers with prompt and reliable information regarding shipment and delivery of the product.

The broad objectives of production planning as outlined have universal application. There is no standard formula and the details of the plan must be tailor-made to suit the individual company need. The development of responsibilities, methods, and controls required to attain recognized production planning objectives must be on a sound basis and this can be accomplished only by study and consideration of all related factors and functions. The remainder of this presentation outlines a basic setup which brings together the principal features of planning and the personnel primarily concerned. We feel that it is an approach which many companies will wish to adapt to their own circumstances.

The Committee Approach

At Ansco we have established a management group which is known as the Production and Distribution Planning Committee. The committee is responsible for the development and approval of annual and quarterly production, distribution, and inventory plans, subject to the final approval of the general manager, and is composed of the following permanent members with the respective primary responsibilities indicated:

Member	*Responsibility*
General planning manager, Chairman	Procurement and distribution
Director of marketing research	Market potential
Assistant treasurer	Finance and profits
Sales service manager	Sales
Production control manager	Manufacturing

The group is maintained as a functional unit through regular meetings on Thursday of the third week of each month, on Thursday of the first week of September of each year, and at such other times as required. Through the assembly and coordination of data relating to potential sales and manufacturing facilities, integrated production, distribution, and inventory plans are prepared with the objective of securing the most balanced and profitable operation possible for each division. No deviations from approved produc-

tion programs are permitted without prior reference to the committee chairman. When any occasion arises in which it appears that a change in the program is required, the matter is cleared promptly by the available members so that there will be no unnecessary loss of production time. The regular activities of the committee revolve around the specific functions shown below:

1. The development and approval of an annual and quarterly sales forecast and manufacturing program.
2. Establishing annual sales directives within the forecast.
3. Quarterly review, revision, and tentative extension of the annual sales forecast and manufacturing program.
4. Providing data from which long-range raw material requirements and purchases can be derived.
5. The development of sound distribution policies that result in more efficient utilization of warehouses and lower transportation costs.

Individual Responsibilities

The general planning manager is the chairman and the only member whose position as an executive centers on the planning function. He must coordinate and integrate the activities of committee members. He must review and analyze annual and quarterly consolidated sales requirements in relation to inventory and procurement of raw materials, planned inventories of finished goods, and current distribution problems and policies, and make recommendations for changes where necessary. He is likewise charged with supplying consolidated performance data on inventory, sales, and production of finished goods and, after approval by the committee, annual and quarterly manufacturing programs, by plant and by product, for submission to the general manager for approval.

The director of marketing research is naturally also quite closely associated with planning. He is depended on to provide appropriate data on economic factors, over-all industry conditions, and company goals for use as a broad framework for the planning of sales and production. This information is provided on a continuing basis during the year in connection with the periodic meetings and through written and pictorial mediums suitable to providing a relatively current disclosure at all times. The director of marketing research is likewise expected to supply seasonal indices by prod-

uct and by month and to provide a sales estimate quarterly for the final quarter of a projected year in advance, which serves as an interim means of maintaining a continuous twelve months' approximation of sales expectancy. It is the assistant treasurer's duty with respect to the committee to look over the consolidated sales requirements set up, with an eye to probable profitability, and to make recommendations for changes where necessary. He is likewise the committee's agent to transmit to the controller sales data required for periodic cash projections which the latter may wish to make.

The sales service manager analyzes all quarterly and annual sales forecasts in relation to promotional plans, over-all competitive positions, and current sales performance, and prepares consolidated forecasts of sales requirements. He also keeps oversight of branch inventory positions, suggesting corrective action where necessary. In cooperation with the marketing research department, he establishes recommended annual sales goals for each district and product for the approval of the general sales manager. It is the part of the production control manager to work up and point out any alterations necessary in approved programs because of facility changes or operating conditions.

General Planning Procedure

Each sales branch compiles and transmits its sales forecast so that it will reach the sales service department by the fifth working day of the second month of each quarter. This forecast covers three months in product detail. The forecast starts with the second month following. The product sections of the sales department review each branch's forecast, making necessary changes in line with their distribution responsibility. The figures from all branches are consolidated into a company forecast and entered on the product sales plan. With the first three-months' forecast as a basis and considering advertising, promotional plans, and marketing research data, the sales service department projects an additional three-months' forecast on the product sales plan by major product groups. From information supplied by marketing research, the sales department also forecasts an additional six months. Thus, the product sales plan at all times covers twelve months. It is then forwarded to the central planning department by the tenth working day of the month. In the central planning department, the product sales plan joins the reports of branch and warehouse in-

ventories received from the accounting department by the fifth working day of the month. With this information, the central planning department establishes a recommended production program.

Considering Production Capacity

The company sales forecast is checked against available production and inventory status. If the normal plant capacities do not meet the long-term net sales requirements, the problem is analyzed in relation to additional capacities required and submitted to production management for appropriate action. If production capacity is available, the next step is to calculate the average rate of production required per month during the next twelve-months' period to meet the sales forecast and to adjust over-all inventories to the desired amounts.

A comparison of the calculated average production required by the forecasts with the production which can be obtained with the present capacities indicates whether or not the present capacity can be used at a uniform rate over a long term and just what the rate of utilization is. The proper balance is then established between producing at a 100 per cent uniform rate throughout the next twelve months (thus building inventories on fast moving items during slack sales periods) and planning minimum and maximum over-all inventories within reasonable limits, considering the time the supply will last, danger of obsolescence, and warehouse limitations.

Flexibility is also considered so that special requirements can be handled and allowances made for fluctuations in sales forecasts. The completed program is subjected to further review to make sure of proper provision for sales requirements, desirable operating levels, and adequacy of inventory plans. The details of the long-range program covering planned production, sales, and inventories are then entered on a master summary form.

Review and Approval of the Plans

This completes the basic work, and not later than the fifteenth working day of the month the central planning department brings up to the Production and Distribution Planning Committee the following for review and approval:

1. Master summary of planned production, sales, and inventories.

2. Planned production program summary.
3. Inventory status summary.

After necessary approvals are received via the committee, the central planning department completes the "authorized shipment" columns on the product sales plans and returns them to the various product sections of the sales service department, and authorizes the plant scheduling units to proceed with the detailed scheduling of machines and operations in accordance with the planned production program. Although top manufacturing management has a ninety-day program at all times, producing departments are given only a monthly schedule thirty days in advance. A final schedule notice is sent to the particular department on the fifteenth day of each month prior to the month scheduled, which freezes that schedule for the following month and indicates that no material difficulties are anticipated at that time.

The product sales sections make the necessary adjustments in branch quotas and enter them in the "authorized shipment" columns on the original sales forecast for each branch. The applicable sales forecast as approved is then returned to each branch so that it will be received by the end of the month. By using a carbon when the "authorized shipment" column on the approved sales forecast is completed, the information is also copied on the "master shipping schedule." This is sent to the finished products warehouse so that shipments can be planned for the designated month.

Conclusion

In the course of the material here presented, the need for sales forecasting and production planning has been covered in general terms with somewhat specific reference to present-day industrial conditions which render these two functions virtually necessities. Their relationship was then briefly examined and a committee system of coordination of planning functions and of executive personnel most concerned with them was described. Further detail of the procedures by which the initial sales forecasts set up by each branch are worked into a related production plan considering all factors was outlined. We find the point of most significance in our procedures to be the recognition of planning in its several directions as properly a single unified function when related to the company as a whole. This is the point which provides the greatest degree of assurance for the company.

MEASUREMENT AND CONTROL OF INDIRECT LABOR

by EARL V. HOPTON,

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A WORD about control and its cousin, cooperation, is appropriate before the specific topic of this article is undertaken, for all such terms tend to lose force through casual use. Control is a procedure for assuring planned performance. It must take place and produce its effect before the record is made. It presupposes that all plans or standards on which action is based have been clearly determined, are stated simply, and are related logically to sound measurement bases. The industrial accountant must share the responsibility for this. Accounting is not limited to a system for recording and then reporting what has happened, but can be of greater assistance to management of the business during the period that the plan of operation is being formulated.

Industrial accounting, therefore, is not concerned primarily with the record of business transactions but starts with a complete understanding of the objectives. If the objectives or plans cannot be expressed clearly and simply by the accountant's technique, something is wrong to begin with. Either the technique is not suitable or the plan has not been conceived on a logical premise nor in an explicit manner. These statements are not submitted as dogmatic conviction but rather as a postulate for consideration in this discussion of the important expense cost familiarly classified as indirect labor.

Nature and Importance of Indirect Labor

Business management need no longer consider indirect labor nor any other type of shop expense as just "so much overhead." There is no cause for inarticulate conceptions of its importance as a part of production cost. Shop expense has become explicit after many years of continual contemplation. However, the definitions of indirect labor usually given are of little value in considering its control. Definitions usually describe indirect labor as an item of cost which cannot be charged directly to an order or process, emphasizing the limitation in the accurate application of this cost item to the product. However, one may conceive of instances in which labor may be directly assigned to a process but cannot be

measured in terms of units produced. It is best perhaps to assume that, because of the many borderline cases, all labor not classified as direct labor is indirect labor. When considering control procedures, we are not primarily interested to know that a cost may be precisely defined, directly assigned to a product, or even that it can be related to production in terms of physical units. Our primary interest is: can it be measured and intelligently planned and, if so, by what means?

When examined from the point of view of its place as a cost of manufacture, labor effort generally classified as indirect looms as an important factor of cost. A recent survey of ten firms in central Pennsylvania indicated that the cost of hourly paid indirect labor, to which this article is confined, in production and service departments (exclusive of mechanical and power labor) ranges in the aggregate from 13 per cent to 76 per cent of total direct labor costs. The average rate for this group of firms for this factor was shown to be 33 per cent. The companies selected included representatives of the following industries: textiles, watches, radio tubes, hard surface floor covering, boilers, machinery, closure seals, mechanical traps, and chemical processes.

What Is Control?

Control must not be confused with control records. Control is something that is closely associated with action. It must be exercised currently during the progress of the work. It obviously can be accomplished only by the person directly charged with the responsibility of managing, that is, the supervisor on the job. This individual, however, must clearly understand what is to be done under varying conditions and constantly changing circumstances. If the methods of operating are definitely established beforehand, corrective action will accompany and coincide with changing situations. In other words, the plan of action must be predetermined by careful thinking and by well-described plans. Although we generally assume control to be the manner of performing, proper reflection will indicate that it is first a process of thinking.

As with any cost, control of indirect labor requires a plan for determining the requirements of the situation. This can be accomplished most satisfactorily by a cooperative approach which involves the persons directly concerned with the problem. Determination of indirect labor requirements is not usually given the amount of study applied to direct labor. As a rule it is not measured. It

has not had the benefit of time and methods study. But the industrial engineer and the cost accountant can bring invaluable assistance to the problem of its control by considering it in a cooperative manner with the supervisor. The latter contributes his basic knowledge and "know how" of the particular cost center problems, the engineer and accountant their experience, training, and objective approach. Such conferences always end with better understanding and greater knowledge of the problem on the part of all.

The Written Plan

Control can be acquired only by a written plan, carefully considered and expressed in a simple and understandable manner. The use of a data sheet for a related group of cost items is the best approach to the fundamental planning of the job to be performed. The plan should not only clearly show the objective but must consider the means of accomplishing it. There are two useful types of indirect labor data sheets. One is designed for determining requirements by the tabular method and the other, though less frequently employed, by the columnar method. It is not too important what form is used. It is the kind of thinking involved in its preparation that counts. The form shown as Exhibit 1 illustrates the tabular method. The following paragraphs cover some of the principal features of its preparation and use.

It is important to choose an activity measurement basis that is logical to each classification of indirect labor. Although we have found that bases which represent time are more desirable, occasionally physical units, such as gallons, yards, or pounds may be used when a time unit is not practicable. Time unit bases of measurement commonly employed are direct labor hours or machine hours. When time units are employed the means of deriving the one hundred per cent activity must be clearly understood. It is not sufficient to indicate on the data sheet the direct labor hour base, for instance, without showing how the maximum load has been derived. In the example given in Exhibit 1, the derivation of direct labor hours at full or one hundred per cent activity is shown as reference (A) in the lower or apron section of the sheet. Before beginning study of an indirect labor cost category, it is helpful to note the operating range encountered in practice. Obviously a clear conception of the work week normally operated is another essential. These data are shown in the uppermost section of the form.

Plant **Random**

Operation **124—Die-Cut and Finishing** (Note: Figures are hypothetical) Year **1948**
Control and Source Account **13103—Indirect Labor** Activity Basis Used **Direct Labor Hours**
Length of Period Covered: Month **X** Year .... Activity Units at 100% **4,333 (a)**
Normal Work Week: Shifts per Day **1** Hours per Shift **8** Days per Week **5** Usual Operating Range: From **66%** To **100%**

ITEM	CLASS CODE	DESCRIPTION	REQUIREMENTS AT ACTIVITY LOADS Min. % 66	Aver. % 83	Max. % 100	RATE	FORMULATION AT 100% LOAD Fixed		Variable		VARIABLE RATE PER M ACTIVITY UNITS	
			(D.L. Operators at work stations) 17	21	25							
		SUPERVISOR CONTROL DATA— (Men per Day)	Men	Men	Men		Men		Men			
1	043	Clean-up	½	½	½		½					
2	084	Trucking	1	1¼	1½				1½			
3	049	Set-up	1½	1¾	2		½		1½			
4	040	Inspection	2	2½	3				3			
		ACCOUNTING CONTROL DATA— (Hours and dollars per month)	Hours	Hours	Hours		Hours	Dollars	Hours	Dollars	Hours	Dollars
5	043	Clean-up	86	86	86	.60	86	$ 52				
6	084	Trucking	172	215	258	.60			258	$155	60	$ 36
7	049	Set-up	258	301	344	.80	86	$ 69	258	$206	60	$ 48
8	040	Inspection	344	430	516	.75			516	$387	119	$ 89
9	070	Attend quality meetings	10	10	10	.80	10	$ 8				
10	041	Take inventory	16	16	16	.70	16	$ 11				
11	046	On-the-job training	20	20	20	.75	70	$ 15				
							218	$155	1,032	$748	139	$173

Specifications and Comments:

Ref. Item	(a) Determination of 100% activity	Shifts per day	Operators per shift	Hours per shift	Days per week	Weeks per month	Hours per month
	Direct labor hours	1	25	8	5	4.3	4,333

1&2 Clean-up and Trucking: (A) When operating at **100%** activity load, efforts of two men will be utilized interchangeably 4 hours (½ man) for clean-up and 12 hours (1½ men) for Trucking.
(B) When operating at **66%** activity load, man will be borrowed from labor reserve force for 4 hours.
(C) Effective labor utilization at sustained intermediate loads depends on ingenuity and judgment of supervisor. It may be found practicable to defer certain work to alternate days.

3&4 Set-up and Inspection: At loads lower than 100%, set-up and inspection skills will be interchanged and supplemented by an operator assigned from DO-IT machine crew.

Form 5844 7-46

EXHIBIT 1

Selection and Display of Activity Levels

Before the expense labor requirements are determined by functional jobs, representative load levels may be selected for specific study. These should represent the probable minimum and maximum loads and may include an intermediate or average load. In the example, the minimum probable load is illustrated as sixty six per cent and the maximum as one hundred per cent. A review of cost centers over a period of time is likely to indicate that erratic fluctuations in the load level are not to be expected and that operations are usually maintained in the neighborhood of representative load levels.

The consideration of somewhat related activities on the same data sheet not only effects consolidation but also stimulates thinking because it immediately suggests comparison among the basic or representative loads for each item with consequent reconciliation of inequities in the predetermined requirements. It is helpful to express the load levels in the number of direct labor personnel employed as well as the per cent activity, especially but not solely to help the supervisor in use of the sheet. Expense requirements and control objectives can be visualized more easily when the operating loads are tied down to the number of direct labor workers located at the machines or the several work stations in the cost center.

The next step is the determination of requirements of indirect labor under varying situations. This information should be kept simple and may be expressed by the number or fractional parts of expense labor persons required per day in the supervisor control data section of the form since the supervisor must be guided in his control thinking by expenditures of effort needed daily. There is naturally some indirect effort which may not occur daily but is required periodically each month, such as window washing, meeting attendance, machine cleaning, inventory taking, etc. These items are relatively unimportant and are included only under monthly requirements in the accounting control data section. The supervisor control data affords the essential basis for operating control. It is simple and easy to comprehend. It permits each supervisor to make current appraisals of whether or not he is "in control." There is then no need to wait in this connection for records and tabulations of actual expenditures against the requirements established.

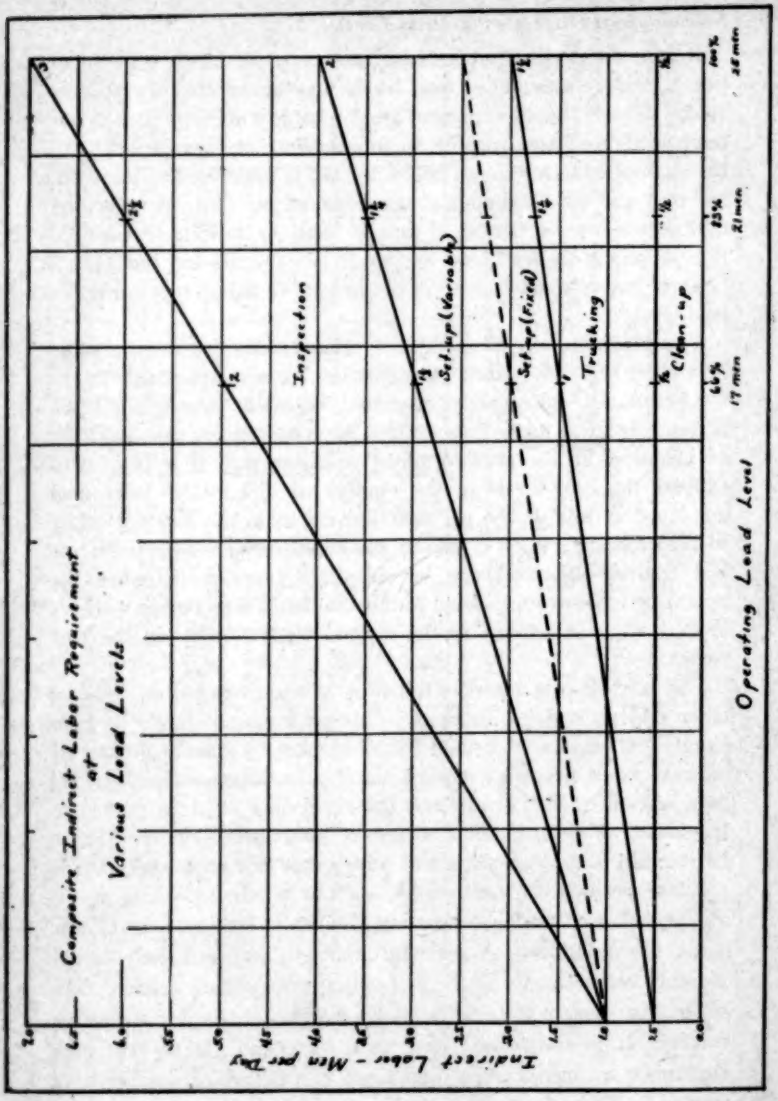
Composite Indirect Labor Requirement at Various Load Levels
Indirect Labor - Man per Day
Operating Load Level
66⅔% 17 min
83⅓% 21 min
100% 25 min
Inspection
Set-up (Variable)
Set-up (Fixed)
Trucking
Clean-up

EXHIBIT 2

Accounting Control

For accounting control purposes, supervision control data must be converted to dollar values and are usually expressed on the basis of a calendar month. The results of conversion of numbers of men required into dollar values is set forth in Exhibit 1 below the simpler data required by the supervisor. To serve financial and cost control purposes, the information should also be formulated into "fixed" and "variable" components after the requirements for representative load levels have been determined. No subdivision of this expense into fixed, quasi-fixed, semivariable and variable are used. These terms involve concepts that are unnecessary and often misleading.

The most satisfactory way to derive fixed and variable components for groups of items or for single functions that do not vary in direct relation to changes in operating loads, is by employing simultaneous equations. A simpler method which is sufficiently accurate for many purposes is to project curves by inspection through the amounts of labor effort determined at representative loads. The adequacy of this method may be seen by referring to Exhibit 2, constructed in this way and illustrating a practical means of showing graphically the information used in the data sheet.

EXHIBIT 2

Explanations on the Data Sheet

The most important part of the data sheet is the apron section headed "Specifications and Comments" and providing space to note the reasoning used in establishing the indirect labor expense requirements. It affords an excellent opportunity for introducing flexibility. The comments on the first line, for example, show that consideration has been given to interchanging the skills of the men who perform the cleaning and trucking functions. Too frequently indirect labor effort is wasted because single functions are assigned to specific persons. There is a tendency to overspecialize jobs. The concept of specialization of jobs and individuals in industry has general acceptance, but it may prove unwise to follow these fundamental laws of management too closely in respect to expense labor control. Consider a sweeper who can employ his effort effectively in a certain cost center for only five hours per day. If his efforts are considered applicable to sweeping only and work instructions do not include a provision for assigning him to another job in the department or even in another department of the plant, three hours of an eight-hour day are wasted.

Principal Uses of the Data Sheet

When the indirect labor expense requirements have been established by means of the data sheet procedure, a copy is prepared for the supervisor. He will be in complete agreement with the written plan because he has had a part in determining the indirect labor needed under different load levels. There are three basic uses of the completed data sheet. First, the data sheet serves as an instant basis for taking intelligent action in respect to the control of indirect labor. This simply means the current adjustment of indirect labor application in varying situations. This is control and is the responsibility of the supervisor.

The data sheet also facilitates planning for cost reduction since it is essentially a blueprint of the best practice achieved to date. The information, expressed in a clear and concise manner, is available for cost improvement thinking by the foreman or a staff engineer. Some individuals recommend the separation of thinking duties from operating responsibility, but this approach may lose much that is constructive. I believe that staff should encourage the operating supervisor to accept a larger share of cost reduction planning. Finally, the data sheet provides the basis for establishing the control record for financial and cost control reporting purposes.

To regard the latter two uses as secondary to control, itself, is not to rob them of a considerable degree of importance. The control record provides management with a means of judging the effectiveness of operation and shows whether or not control has been achieved. Financial control is made possible by the data sheet information which permits forecasting costs at different volumes. The segregation of expense costs into fixed and variable components is indispensable when considering pricing policy or special applications of economic problems, such as alternate methods, new equipment, expanded facilities, additional lines, and other problems involving changes in plans or policies.

Basis for Control Records

The heart of the methods of indirect labor measurement and control described in this article is comprised in the manner in which the data sheet is prepared and used. However, there are some further observations which should be made in connection with the indirect labor control technique, especially in the over-all report stage, for which the data sheet can serve only as a reliable detailed basis. For instance, when dollar value indirect labor ex-

pense allowances are used in the control report for comparison with actual expenditures, it is advisable to reflect wage rate adjustments in the allowance. The data sheet permits easy determination of these since each job or function is shown at a specific rate. It becomes a simple matter to give effect to changes in the rate and note the date of the change. That is the proper time also to adjust the dollar value allowance. If reports are made against the forecast budget it is desirable to segregate the deviations due to wage rate changes from those that are due to operating effectiveness.

If it is considered desirable to include in reports breakdown of actual indirect labor costs as set off against the allowance for each function or classification such as inspection, setup, trucking, cleaning, etc., this can be accomplished readily by assembly of information from the data sheets for the various centers. However, the writer believes that general reports by classifications or functions are not necessary if the supervisors are control-minded. If they are always ready to interpret deviations, the answer will be known before the report is issued. If reporting is minimized, it will be possible not to "make a clerk out of the supervisor," as the time required to keep tabs through the data sheet on indirect labor utilized is a matter of minutes. Other simple methods of doing so are, of course, possible to devise.

Revising the Data Sheets

When expense requirements are altered as a result of changed methods, the data sheet should be revised immediately. Although some firms may follow a policy of not changing allowances and standards until the beginning of the next fiscal period, it will be found helpful to keep the data sheet information up to date at all times. When this procedure is followed, the information always represents the company's latest—and presumably best—practice and obviates the confusion and additional effort which would otherwise be required to make all the data current when a new year starts. Then, too, such information will be available for currently interpreting the reasons for variances from the allowances and standards adopted at the start of the present fiscal period.

Besides the functional indirect labor jobs which have been referred to, there are other charges related to labor that are often classified as indirect expense. These items include overtime premium and shift differential payments incurred in connection with all

labor effort. Although they have been omitted from this discussion for the sake of expediency, their control is important and should not be minimized. Another type of labor expense, the importance of which is often overlooked, is composed of a number of items sometimes grouped under the heading of employee benefits. Such costs include federal and state unemployment taxes, contributions required by the federal insurance contributions act, company retirement and health insurance programs, vacation pay, holiday pay, etc. These allied labor expense items apply to the earnings of all wage and salary employees and often aggregate more than ten per cent of the base pay.

Conclusion

Careful reflection will indicate to business managers and staff the importance of indirect labor as an item of cost and the significant influence careful control of this expense item may have on the morale of workers and organizational policies. The characteristics of indirect labor are easily explored and readily visualized by putting the plan for control in writing. This plan, which must be simple and understandable, can be established only through a cooperative approach on the part of the industrial accountant. It must recognize both the job to be accomplished and the proper measurement of effort required. No one is better fitted for this responsibility than the industrial accountant who has the technique to develop the control procedure in such manner as to assure the coordination of the efforts of all staff and operating departments.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, February 1, 1948

Capital Price Adjustment Method for Deflating Inflated Profits
by E. Stewart Freeman

Good Inventory Management
by Thomas B. Noble

Reexamination of Standard Costs
Research Series No. 11

USES OF A PARTS CLASSIFICATION CODE

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THE USE of punched tabulating equipment systems for production control and for inventory accounting purposes usually requires a plan of classifying parts by a numerical code. Companies frequently use some type of code to identify parts by class, but in many cases part numbers are simply assigned in numerical order as the parts are brought into existence, perhaps with a letter prefix which might be but usually is not applied as an initial step towards classification. As in the case described here, the letter is commonly used only to hold the numerical digits to four. When, say, E-9999 is reached, the letter prefix is changed and the number series begins again so that the next number given would be F-1. To attempt renumbering of all parts for classification purposes in such a situation would ordinarily be an impractical task. In the instance covered by this article, the element of parts classification not present in the basic numbering is supplied by a simple two-digit prefix code (Exhibit 1) which need not be used with the part number except when classification is required.

PART NUMBER CLASSIFICATION CODE

First digit		*Second digit*	
0	Current production	0	Purchased part or assembly
1	Service part or assembly	1	Purchased and modified
2	Experimental	2	Manufactured part
3	Part and assembly for other plants	3	Manufactured structural part
4	Capital jobs	4	Manufactured structure
5	Expense jobs	5	Manufactured assembly
6	Tires	6	Part made from blank
7	Parts purchased from other plants—Current	7	
8	Parts purchased from other plants —Service	8	
9	Supply	9	Unfinished parts manufactured

NOTE: First digit of the code "0" through "6" is also used as the production order suffix series.

EXHIBIT 1

Mechanics of the Code

This code designation has about the same relationship to the part number proper that the part name has and is therefore sepa-

rable from it. It is dropped, for instance, in parts price lists, price catalogs, etc., as the code has no particular significance to dealers, distributors, or the sales department. One great advantage of having such a classification code serviceable for manufacturing and inventory purpose but susceptible of being omitted where not applicable is the reduction of the likelihood of error in parts orders, as it leaves the part number for this purpose at four digits.

Inventory classifications and the classifications needed in the production departments result from combinations of first and second column digits. For instance, an "00" code would indicate a part applicable to current production and purchased from outside vendors for use on equipment without further processing. An "01" code would indicate a part purchased for similar use but on which further work is necessary.

Accounting Department Application

The accounting application and use of the parts classification code serves several purposes. The first of these is in the analysis by inventory account numbers correlated with the code, of the parts transactions for each month for the purpose of the necessary accounting entries. The code is not entered on source documents but is picked up by matching summary cards with a classification code deck which also carries the standard cost. By use of tabulating equipment, the various withdrawals and receipts are then sorted by code, valued at standard cost, and summarized by code so that the totals may be accumulated for each inventory account.

The second accounting department use of the code is in the physical inventory valuation. The inventory cards are keypunched, then sorted and listed by code. The finished parts are valued during this process by the master deck referred to above but the work in process is listed only by code groups in part number order as the process inventory must be valued according to the stage of completion. However, the grouping by classification is very useful. For example, structures in process are valued by a different procedure than basic parts. The code is also used in auditing the standard cost lists from time to time as the second digit code is a good check on the cost components of various parts items. An "00" part should not show labor, overhead, or raw materials, an "04" part would have these elements and would also include a number of lesser parts while a "24" part would probably be job-costed.

Uses for Production Planning

The production planning department application of the parts code is chiefly in schedule explosions which break the production schedules down to basic manufactured and purchased parts in order to group all parts by procurement and process requirements. This aids in placing orders for the parts purchased from outside vendors, and so also in establishing manufacturing schedules. These must afford proper lead times for the various structures and manufactured parts, and must allow for any special handling, such as for experimental projects. A good example of special handling is found in the records necessary in our plant for parts and assemblies being produced on order for other plants of the company and for those purchased by our plant from other plants. Any transaction relating to a part which has a first digit code of "3" or "7" is directed to the attention of the special section set up for this purpose.

Facilitating Material Control and Production Engineering

The material control department also makes extensive use of the parts classification system. Based on the master production schedule explosions referred to, the tabulating department produces a schedule of material requirements, segregating by code classification parts on which no production materials are required. This group would include those parts which are to be purchased from other plants and also those from outside vendors. In addition, structures and assemblies to be manufactured are segregated in this schedule from structures and assemblies which are made from basic parts.

A specific use and requirement of material control made necessary the second column digit "1." To cost accounting "1" would be the same as "2" (as long as any labor was applied an item could be considered as manufactured), but for the purpose of breaking down functions or ordering the code "1," purchased and modified parts, is treated along with purchased parts. The ordering function for purchases of these parts from outside vendors is like that of obtaining other purchased parts and does not follow raw material procurement procedure.

Responsibility for determining routing and operations for all production orders gives the production engineering department a vital interest in use of the parts classification code. This depart-

ment needs to know whether a part is purchased, manufactured, a structure, an assembly, etc. Therefore the code is carried on all operating and routing cards. However, time economy effected by use of the code in this department is somewhat offset by the fact that most of the work in establishing the code classification on all new parts must be done here.

Development and Maintenance of the Parts Code

So far in this presentation, uses of the parts classification code have been explained but no reference has been made to the development and maintenance it necessitates. There is considerable clerical work in setting up and maintaining such a code although we feel that this work is more than offset by the uses. Nevertheless, it is a factor to be considered. The original coding process is the principal task, for when all existing parts have been coded, the system can be kept up in accordance with a regular procedure. The original list was made up in our case from the various order files in the material control and production planning departments. These parts were all coded, matched against the current physical inventory, and additions to the code were made for uncoded parts in the physical inventory listing. This permitted a fairly wide coverage for the list right at the start although, after a year of use, there are still some parts turning up which are uncoded due to the fact that they were inactive or perhaps were overlooked in the physical inventory.

One service to all departments which should not be overlooked in evaluating the classification system represented by the code and basic part number is the preparation from coded tabulating cards of a master catalog available for reference for *any purpose whatever* that involves a part number. This list is in part number order and shows part number, code, and part name. With us, this catalog is the only complete list of all parts as other listings, for various reasons, exclude one category or another. For instance, the parts price list issued to dealers includes only parts which are sold for replacement purposes and does not include structural parts never sold for repair in the field. Manufacturing records, on the other hand, exclude all purchased parts, while the purchasing department records exclude manufactured parts. This master list is therefore a "dictionary" in which the part name and code can be checked for any part number.

Parts List Revisions

Code changes and additions must be provided for. New parts are devised, old ones may be made instead of bought or vice versa, and many other like circumstances may call for changes. A procedure involving the use of a special form has been found necessary. This form may be originated by any of the departments in which the occasion for change arises but must follow an established routing so that it is reviewed by production engineering, material control, and cost accounting departments before being sent to the tabulating department for insertion in the code deck.

Once a month a list of all code changes and additions is issued to all holders of the code catalog. Once every three months a complete new code catalog is run superseding all previous issues and revisions. This frequency has so far been found adequate, except that in the case of a change affecting a large number of parts a new catalog is run at once. Such a major change may happen when a new model of equipment is put on the market or when models are dropped. Changes in code must be tied in with rotating inventory counts and reconciled at the close of a month's business so that cost accounting may make sure that all inventory items carry proper coding and any indications, such as obsolescence, disclosed by code changes, are given recognition.

Adaptations

The code system which has been explained and the applications described have been devised to meet the needs of a particular company and, therefore, will not fit all production control and accounting systems. However, I believe it can be adapted to other companies if there is recognition that requirements for inventory accounts and production records will be a major factor in establishing the original code. The functioning of a classification code system also depends upon individual company characteristics. It will function best in a plant where flow of production is fairly well established and model changes are kept to a minimum. Difficulties will crop up if new models are introduced with any frequency or if frequent changes are made between "to make" and "to buy." Despite this, in such situations a part classification code may be doubly important to provide information for accurate inventory accounting and production planning.